International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075 (Online), Volume-11 Issue-8, July 2022

Real Time Security System using Yolo Technology

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Abstract: ***For the majority of individuals, safety has now become a top priority. The rise in bank threats is concerning, as banks are frequently targeted by criminals. The rise in bank crimes has become a severe problem. To combat such dangers, it is critical to verify the identity of the person who enters the bank. The primary goal of this project is to create a gadget for bank security using Image processing. Because of this, many individuals who may or may not know us are gaining access to our personal workspace. There are other difficulties, such as the loss of important papers and valuables. Even the most advanced technology, such as a fingerprint sensor lock, may be easily opened. As a result, we will create an AI-based security room and locker system to address this issue. With the aid of our growing project, we were able to use facial recognition to discover and analyze people, as well as monitor them. In the proposed work, we apply LBPH (local binary pattern) and machine learning approaches to tackle the present system problem of reducing the recognize time of many items in less time with the best time complexity.***

Keywords: AI-Based Security, Local Binary Pattern, Image Processing, Facial Recognition

I. INTRODUCTION

The first and most important necessity for the entire region, especially in a high-traffic location, is security. Nowadays, CCTV cameras are installed at every location to monitor the actions that take place in that region. Surveillance is simply the act of keeping an eye on an area where security is essential. Surveillance could be done with or without human assistance, such as in a security system where a human closely examines the images acquired by CCTV cameras, or in stand-alone systems. Facial recognition techniques are incorporated for authenticating the individual in gateways in order to efficiently construct a system with the use of CCTV monitoring. Image processing is used to validate the face taken in the image by comparing it to the faces in the database. The control system will take the necessary action depending on the validation result.

Manuscript received on 06 June 2022 | Revised Manuscript received on 11 June 2022 | Manuscript Accepted on 15 July 2022 | Manuscript published on 30 July 2022.
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The video surveillance system, which is important in the security field, is based on Closed Circuit Television (CCTV), although the data stream is mostly sent from the front-end camera to the control center. For this reason, it is also known as the CCTV system in certain publications. In the field of security, surveillance cameras were originally integrated into Physical Protecting Systems (PPS) to replace patrol guards in monitoring the intrusion detector's alert. During the investigation of the 2005 London bombings, surveillance footage provided crucial information that helped to identify the culprits and reveal their criminal activity. It was the first time that governments recognized the value of video surveillance systems in ensuring the safety of municipal residents. Since then, video surveillance systems have become one of the most important components of metropolitan security infrastructures. It is widely agreed that video surveillance is effective in crime prevention and in significantly reducing certain crimes. Robbery, violent assault, and motorbike theft are the top three forms of crime tracked and prosecuted using video surveillance, according to data. For example, once video monitoring was installed in public spaces such as parking lots and streets, there was a 51 percent drop in crime. With the growing use of video surveillance systems, both governments and the general public pay considerably greater attention to the input-output ratio and its rationale. There is little question that additional surveillance cameras will be installed in public locations for public safety reasons, but the system size, which is often measured by the number of front-end cameras, is restricted by limited investment. Furthermore, public anxiety is growing in response to concerns about personal privacy following the widespread deployment of surveillance cameras.

II. RELATED WORKS

This study [3] discusses several automated and real-time surveillance approaches enabling abnormal event detection in security applications to recognize dynamic crowd behavior. The fact where we cannot manually monitor the unexpected and complicated crowded surroundings is a vital feature of public place security and protection. The aberrant behavior algorithms have been developed to increase efficiency, pixel occlusion resistance, generalizability, computational complexity, and execution time. We broadly grouped methods into multiple categories such as tracking, classification based on handmade extracted features, classification based on deep learning, and hybrid approaches, similar to the state-of-the-art anomalous behavior detection of crowded situations. The latest developments and applications in image processing systems in order to further the study field by examining and assessing recent accomplishments in published papers.

As a consequence, improved image processing systems in a variety of applications may be built, as well as novel image processing approaches. [4]

In each photograph, keep an eye on the target region and look for person, fire, and strange movement. When the gadget detects movement in a specific region, it sends an email message to the user. Because this approach does not record the complete video but only saves it when human motion or firing is recognized, the available memory space is restricted. [5] A smart video surveillance system that uses low-power embedded devices to run AI algorithms. The computer vision technique, which is commonly used in surveillance applications, is designed to detect, count, and monitor the movements of persons in the area. A networked smart camera system is required for this application. Using a MobileNet-SSD architecture, the suggested AI application can detect persons in the monitoring area. [7] A smart monitoring system that would serve as a security solution A security camera with night vision capabilities is interfaced with a Raspberry Pi in the proposed smart surveillance system. Real-time image processing is done with OpenCV. Because it employs a credit card-sized chip Raspberry Pi, this system proved to be a cost-effective monitoring system (RPI). The suggested system's technique entails breaking down a real-time video collected by the camera into distinct frames. Image processing techniques in Python are used to process each frame. [8]

III. EXISTING METHOD

Surveillance cameras are solely installed within the security room in this present system. Every day, it will record video. If there is an issue, bank personnel will review the tape and investigate the situation. Implemented a password-based security mechanism. However, it is not safe. Effectiveness is a key feature of any real-world application system, particularly a video surveillance system that plays a critical role in public safety. In general, system effectiveness refers to an assessment of how well a system satisfies application requirements under certain circumstances. Because video surveillance systems include features of both an information system and a sensor network, the problem of their efficacy should be addressed from both perspectives. A typical IT system consists of network, storage, and analysis subsystems that are cycled by dash-line. The above-mentioned hardware consists mostly of universal IT components and equipment; nevertheless, the efficacy of these components has a long history of study, with numerous mature accomplishments that may be implemented into a video surveillance system.

IV. DISADVANTAGES

The surveillance camera is not operating correctly. Surveillance camera and watchman are still solely watching people in the Bank locker room. If there is an issue or a crime within the ATM, they can view the entire film before making a decision. High processing time.

V. PROPOSED METHOD

In order to identify human entry, an advanced security system must be installed. We provide a smart security system which can detect human intrusion and alerts the user or the appropriate authority. When a human motion is detected, the control unit uses face recognition to process the images captured by the camera. The face of the individual is matched to the faces in the database photos. When the database photographs do not match, an alert is sent to the authorized user, alerting them to an emergency in the region. With this method, theft may be avoided, and an unauthorized person cannot flee.

Images of a watchman and a bank officer are taught to our processor in our suggested method. The video is continually recorded by the processor. If an unfamiliar individual attempts to enter the room, the camera will assess the situation and relay information to the user through email using machine learning. We employed the Local Binary Pattern Algorithm in this project (LBPH). Face detection and identification will be investigated by LBPH. We will use AI and OPENCV to locate people in real time in our suggested system. After the image is captured, it is pre-processed as well as compressed. The model is trained using images. It is learned by extracting the desired pattern from the picture using feature extraction. The picture is then compressed using feature fusion and dimension reduction for dependable and real-time performance.

VI. BLOCK DIAGRAM

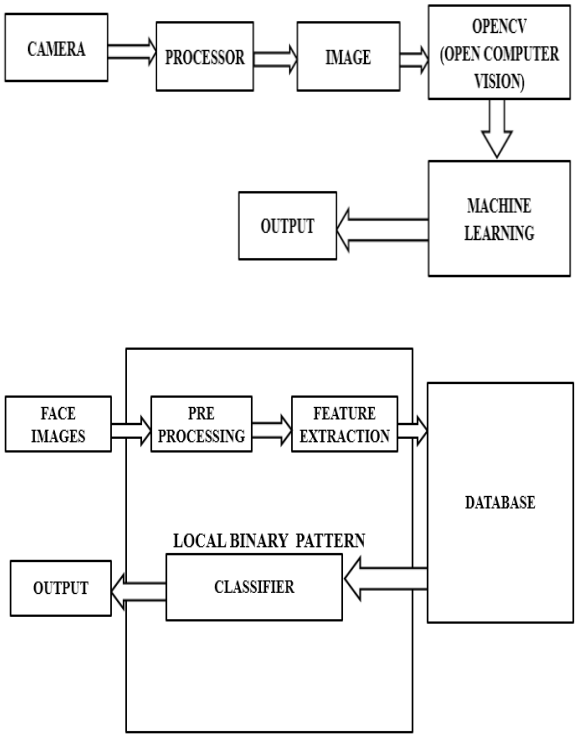

Figure 1. BLOCK DIAGRAM OF PROPOSED SYSTEM

A. Web Cam

A webcam is a video camera that transmits or streams its image to or from a computer to computer network in real time.

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The video stream may be preserved, viewed, or forwarded to other networks via systems like the internet and email as an attachment once it has been "caught" by the computer. When a video stream is delivered to a distant site, it can be preserved, watched, or resent.

B. Processor

The logic circuitry that listens to and executes the fundamental instructions that operate a computer is known as a processor (CPU). The CPU is the most important and important integrated circuits (IC) chip in a computer since it interprets the majority of commands. Most fundamental arithmetic, logic, and I/O activities are performed by CPUs, which also allocate commands to other devices and components in a computer.

C. Opencv

OpenCV is a cross-platform library that allows us to create real-time computer vision apps. It focuses primarily on image processing, video recording, and analysis, including capabilities such as face detection and object detection. We'll show you how to use OpenCV in your apps in this tutorial. One of the most widely used computer vision libraries is OpenCV. A good knowledge of the fundamentals of OpenCV is essential if you want to begin your adventure in the field of computer vision. In this essay, I'll try to explain the most fundamental and significant ideas of OpenCV in an easy-to-understand manner.

D. Machine Learning

A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning system that can take an input picture, assign relevance (learnable weights and biases) to various aspects/objects in the image, and distinguish between them. When compared to other classification methods, the amount of pre-processing required by a ConvNet is significantly less. While basic approaches need hand-engineering of filters, ConvNets can learn these filters/characteristics with enough training.

E. Lbph- Local Binary Pattern

Local Binary Pattern (LBP) is a basic yet effective texture operator that identifies pixels in an image by thresholding each pixel's neighborhood and treating the result as a binary integer. Face detection is the process of locating and extracting faces (location and size) from an image for use by a face recognition system. Face Recognition: The face recognition algorithm is responsible for determining features that best characterize the picture after it has been retrieved, cropped, scaled, and generally converted to grayscale.

VII. MATERIAL AND METHODS MODULE LIST

- Dataset Creation
- Image preprocessing
- CNN Architecture
- Model development

A. Dataset Creation

The photos of authorized persons are acquired by photographing 30 of them, and this is considered the input dataset. The dataset serves as the foundation for the model's training. Create a dataset with regard to person name and person image using OpenCV module file and python programming. The dataset for persons is built in this module using OpenCV-python. One thousand images were gathered from all peoples.

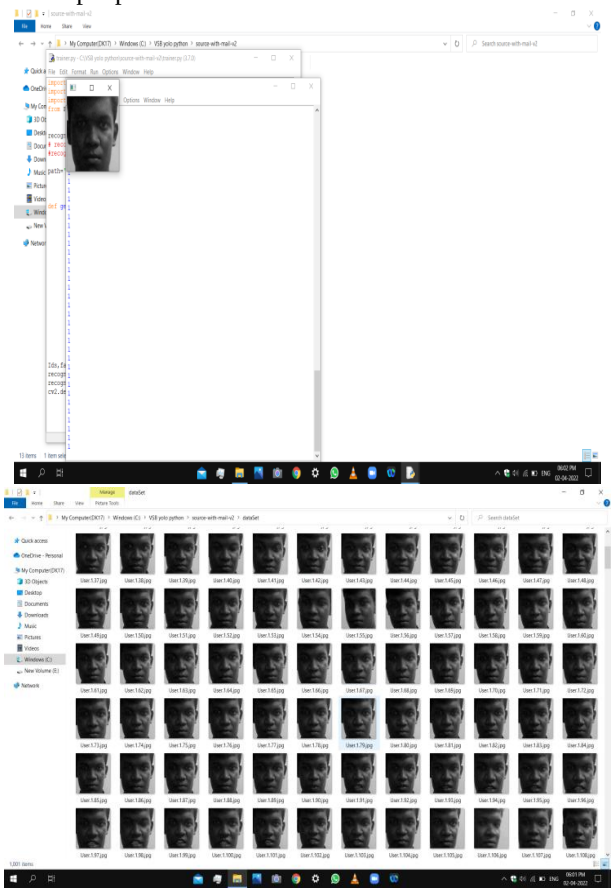

Figure 2. DATASET CREATION

B. Image Preprocessing

Object recognition in a picture should be performed. This method will most likely begin with image processing methods such as noise reduction, followed by filtering of (low-level) features to locate lines, regions, and perhaps places with certain textures. The idea is to consider the sets of these forms as a single entity. The reason for this is that one Artificial Intelligence problem is that an item will appear different when seen from different angles or illumination. Manipulation of data in the form of a picture using a variety of alternative methodologies. Binary images are two-dimensional or bi-dimensional images. This means that a single bit represents each pixel (0 or 1). The two colors of a binary picture are usually black and white, but any two colors could be used. Gray Scale Image - A gray scale image would be a black-and-white digital image wherein the intensity is the sole data provided and each pixel's value represents a single sample. The strength will range between 0 and 255. The value 0 represents the lowest value, while 255 represents the maximum value. Color Image - A color image is always a digital image in which the value for each pixel is determined by the three primary colors red, green, and blue. Each color's intensity is defined by a value between 0 and 255.

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C. CNN Architecture

Bionic CNNs are employed in the development of this system. It suggested lowering the number of parameters and altering the network architecture just for visual tasks. Convolutional neural networks are often composed of a sequence of layers that may be classified according to their function.

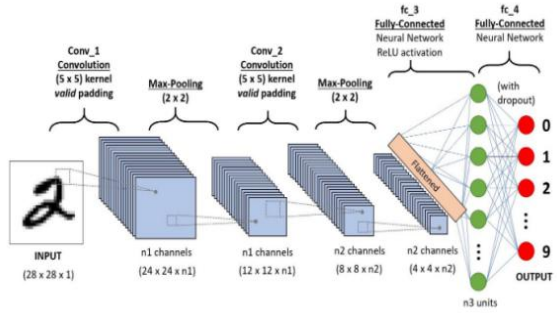

Figure 3. CNN ARCHITECTURE

Convolution Layer - On the inputs, this layer performs a 2D convolution. The "dot products" between weights and inputs are "integrated" across "channels." Filter weights are swapped between receptive fields. The "width" of the filter number would be the same as the "width" of the output volume. 2. Activation Layer - It prioritizes ReLU in order to boost network non-linearity without disrupting the network's receptive fields of convolutional layers, resulting in quicker training. LeakyReLU discusses the vanishing gradient problem. 3. Softmax - A form of activation plate that is often found near the end of the FC layer. The results may be used to create a Normalized exponential function. When paired with cross-entropy loss, provide a discrete and convenient probability distribution vector. 4. Pooling Layer - Convolutional layers give activation maps, however the pooling layer down samples activation maps via nonlinear down sampling. Pooling is becoming less competitive, filter sizes are shrinking, and pooling is being phased out. 5. FC Layer -This is a typical neural network that may be considered as the ultimate result of a learning process in which maps extract visual characteristics to produce the required outputs. It is often adaptable to classification/encoding processes. The typical result is a vector, which is subsequently softmaxed to indicate classification trust. Outputs might potentially serve as a "bottleneck."

D. Model Development

Developed model is deployed on the face detection code to monitor. The essential information given to the algorithm to differentiate eligible persons. These duties are frequently performed unconsciously by the human visual system, but for a computer to approach human performance, extremely skillful programming and a wide spectrum of processing capacity are required.

VIII. EXPERIMENTAL RESULTS

A. Output- Alert

If an unauthorized individual enters the security area, the image will be taken and sent to an email address as an alarm message.

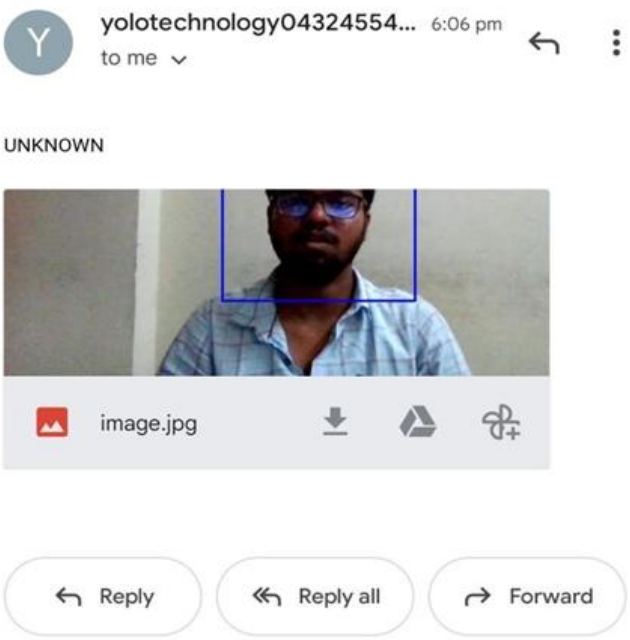

Figure 4. ALERT

When an authorized person (from the trained person dataset) reaches the security area, it is recognized and allowed to enter.

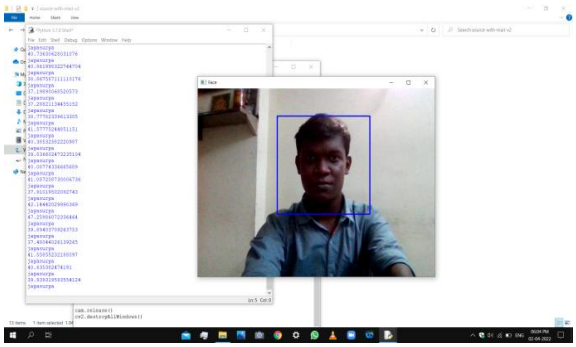

Figure 5. OUTPUT

IX. CONCLUSION

We will construct an AI-based security room monitoring system in this project. Face recognition and machine learning are used in this security system. It is more secure than the previous system. The majority of assessment methods focus on detection accuracy at the pixel or area level, and do not consider the amount of usable information. The possible applicability of suggested risk entropy in the evaluation of automatic detection methods in light of police application criteria is demonstrated by a comparison between manually labeled data and computer vision algorithm output.

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